What is Claimed is:

1. A method for processing a photolithographic reticle, comprising:

positioning the reticle on a support member in a processing chamber, wherein the reticle comprises a metal photomask layer formed on a silicon-based substrate, an anti-reflective coating disposed on the metal photomask layer and a patterned resist material deposited on the anti-reflective coating;

etching the anti-reflective coating with an oxygen-free processing gas; and

etching the metal photomask layer with an oxygen containing processing gas.

2. The method of claim 1, wherein the metal photomask layer comprises chromium and the anti-reflective coating comprises chromium oxynitride.

3. The method of claim 1, wherein the silicon-based substrate comprises an optically transparent silicon-based material selected from the group of quartz, fused silica, molybdenum silicide, molybdenum silicon oxynitride, and combinations thereof.

4. The method of claim 1, wherein the oxygen-free processing gas comprises a halogen containing gas selected from the group of chlorine (Cl_2), silicon tetrachloride ($SiCl_4$), boron trichloride (BCl_3), and combinations thereof.

5. The method of claim 4, wherein the oxygen-free processing gas further comprises an inert gas selected from the group of helium, argon, xenon, neon, krypton, and combinations thereof.

6. The method of claim 1, wherein the oxygen containing processing gas comprises an oxygen containing gas selected from the group of oxygen (O_2), carbon dioxide (CO_2), and combinations thereof, and a halogen containing gas selected from the group of chlorine (Cl_2), silicon tetrachloride ($SiCl_4$), boron trichloride (BCl_3), and combinations thereof.

7. The method of claim 6, wherein the oxygen containing processing gas further comprises an inert gas selected from the group of helium, argon, xenon, neon, krypton, and combinations thereof.

8. The method of claim 1, wherein the etching of the reticle comprises introducing the oxygen-free processing gas or the oxygen containing processing gas into a processing chamber, maintaining the processing chamber at a pressure between about 2 milliTorr and about 25 milliTorr, maintaining the reticle at a temperature between about 50°C and about 150°C, and generating a plasma by supplying a source RF power between about 250 watts and about 700 watts to a coil in the processing chamber.

9. The method of claim 8, further comprising applying a bias power to the support member of about 50 watts or less.

10. The method of claim 6, wherein oxygen comprises between about 5% and about 30% of the oxygen containing processing gas.

11. The method of claim 1, wherein etching the metal photomask layer with an oxygen containing processing gas comprises introducing the oxygen containing processing gas into the processing chamber containing the oxygen-free processing gas while maintaining a plasma.

12. A method for processing a photolithographic reticle, comprising:

positioning the reticle on a support member in a processing chamber, wherein the reticle comprises a metal photomask layer formed on a silicon-based substrate, an anti-reflective coating disposed on the metal photomask layer and a patterned resist material deposited on the anti-reflective coating;

introducing an oxygen-free processing gas into the processing chamber;

generating a plasma of the oxygen-free processing gas;

removing exposed portions of the anti-reflective coating;

introducing an oxygen containing gas into the processing chamber; and

removing exposed portions of the metal photomask layer.

13. The method of claim 12, wherein the metal photomask layer comprises chromium and the anti-reflective coating comprises chromium oxynitride.

14. The method of claim 12, wherein the silicon-based substrate comprises an optically transparent silicon-based material selected from the group of quartz, fused silica, molybdenum silicide, molybdenum silicon oxynitride, and combinations thereof.

15. The method of claim 12, wherein the oxygen-free processing gas comprises a halogen containing gas selected from the group of chlorine (Cl_2), silicon tetrachloride ($SiCl_4$), boron trichloride (BCl_3), and combinations thereof.

16. The method of claim 15, wherein the oxygen-free processing gas further comprises an inert gas selected from the group of helium, argon, xenon, neon, krypton, and combinations thereof.

17. The method of claim 12, wherein the oxygen containing processing gas comprises an oxygen containing gas selected from the group of oxygen (O_2), carbon dioxide (CO_2), and combinations thereof, and a halogen containing gas selected from the group of chlorine (Cl_2), silicon tetrachloride ($SiCl_4$), boron trichloride (BCl_3), and combinations thereof.

18. The method of claim 17, wherein the oxygen containing processing gas further comprises an inert gas selected from the group of helium, argon, xenon, neon, krypton, and combinations thereof.

19. The method of claim 12, wherein generating the plasma comprises maintaining the processing chamber at a pressure between about 2 milliTorr and about 25 milliTorr, maintaining the reticle at a temperature between about 50°C and

about 150°C, and supplying a source RF power between about 250 watts and about 700 watts to a coil in the processing chamber.

20. The method of claim 19, further comprising applying a bias power to the support member of about 50 watts or less.

21. The method of claim 12, wherein oxygen comprises between about 5% and about 30% of the oxygen containing processing gas.

22. A method for processing a photolithographic reticle, comprising:

positioning the reticle on a support member in a processing chamber, wherein the reticle comprises a metal photomask layer formed on a silicon-based substrate, and a patterned resist material deposited on the anti-reflective coating;

etching the metal photomask layer with a processing gas for a first period of time, wherein the processing gas has a first oxygen concentration;

increasing the oxygen concentration of the processing gas to a second oxygen concentration greater than the first oxygen concentration; and

etching the metal photomask layer with the processing gas for a second period of time at the second oxygen concentration.

23. The method of claim 22, wherein the metal photomask layer comprises chromium and the anti-reflective coating comprises chromium oxynitride.

24. The method of claim 22, wherein the silicon-based substrate comprises an optically transparent silicon-based material selected from the group of quartz, molybdenum silicide, molybdenum silicon oxynitride, and combinations thereof.

25. The method of claim 22, wherein the processing gas comprises a halogen containing gas selected from the group of chlorine (Cl_2), silicon tetrachloride ($SiCl_4$), boron trichloride (BCl_3), and combinations thereof.

26. The method of claim 25, wherein the processing gas further comprises an inert gas selected from the group of helium, argon, xenon, neon, krypton, and combinations thereof.

27. The method of claim 22, wherein increasing the oxygen concentration of the processing gas comprises introducing an oxygen containing gas selected from the group of oxygen (O_2), carbon dioxide (CO_2), and combinations thereof, to the processing chamber.

28. The method of claim 22, wherein etching comprises maintaining the processing chamber at a pressure between about 2 milliTorr and about 25 milliTorr, maintaining the reticle at a temperature between about 50°C and about 150°C, and generating a plasma by supplying a source RF power between about 250 watts and about 700 watts to a coil in the processing chamber.

29. The method of claim 28, further comprising applying a bias power to the support member of about 50 watts or less.

30. The method of claim 1, wherein the first oxygen concentration comprises 0% of the processing gas and the second oxygen concentration comprises between about 5% and about 45% of the processing gas.